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Jauhal

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(54) **SCHEDULED RECOVERY IN A DATA PROTECTION SYSTEM**

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CPC ***G06F 11/1469*** (2013.01)

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None
See application file for complete search history.

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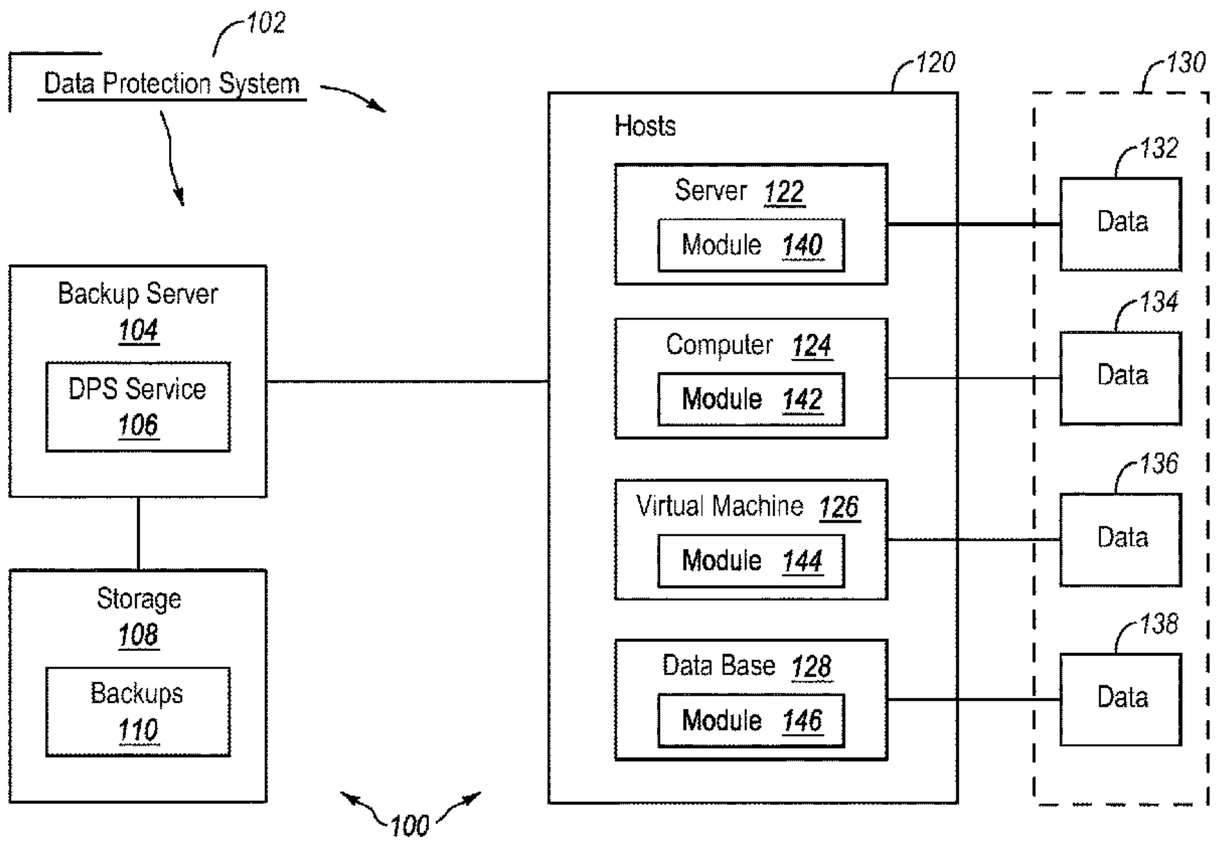
(57) **ABSTRACT**

Systems and methods for scheduling a recovery operation for a host. A user interface is displayed and a recovery operation is configured. Configuration information for the recovery operation is stored and associated with a schedule that is also set via the user interface. The recovery operation may be an ad hoc recovery operation, a periodic recovery operation, and/or a validating recovery operation.

16 Claims, 3 Drawing Sheets



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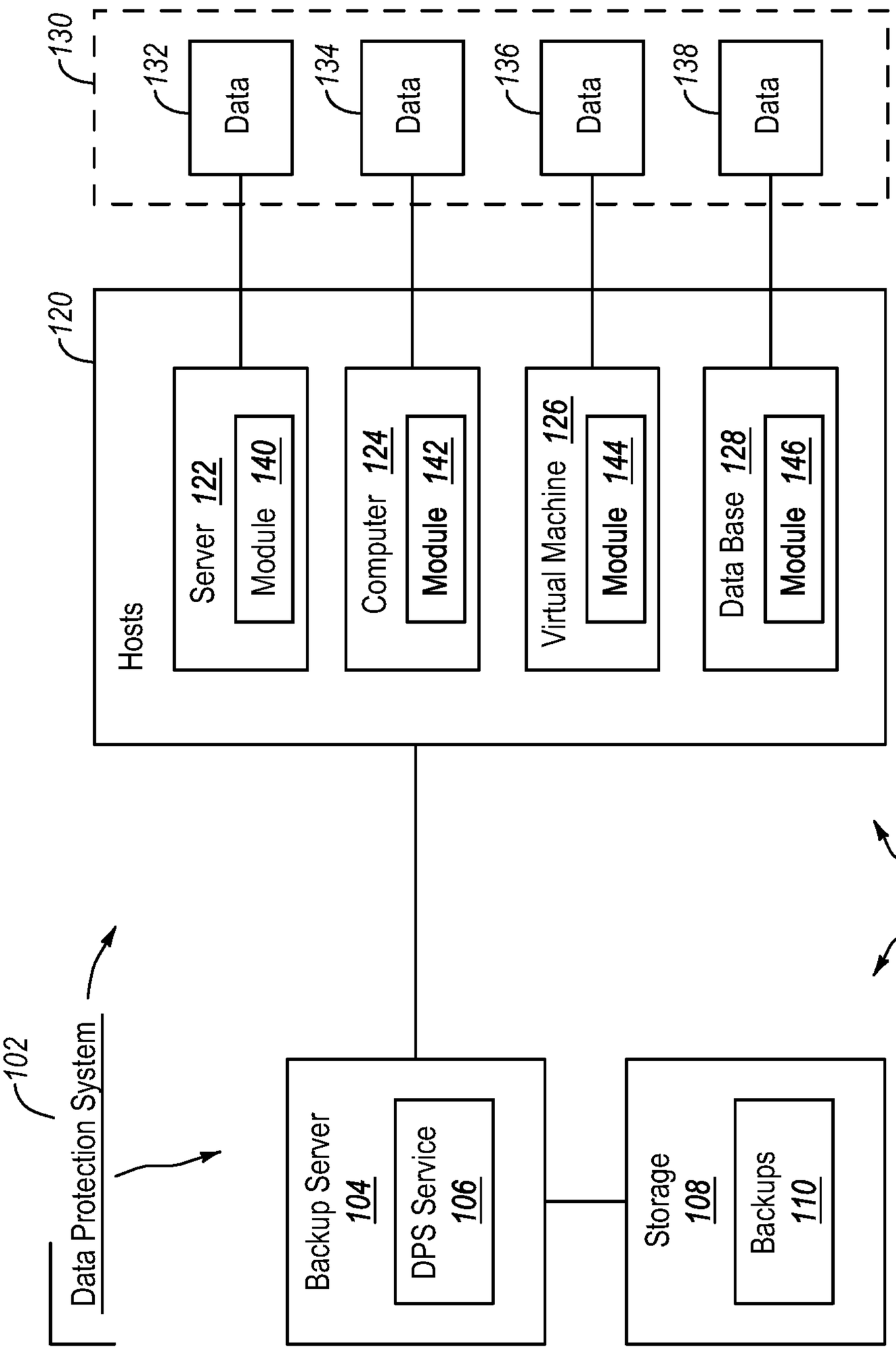
130
132
Data
134
Data
136
Data
138
Data
120
Hosts
Server 122
Module 140
Computer 124
Module 142
Virtual Machine 126
Module 144
Data Base 128
Module 146
100
102
Data Protection System
Backup Server 104
DPS Service 106
Storage 108
Backups 110

FIG. 1

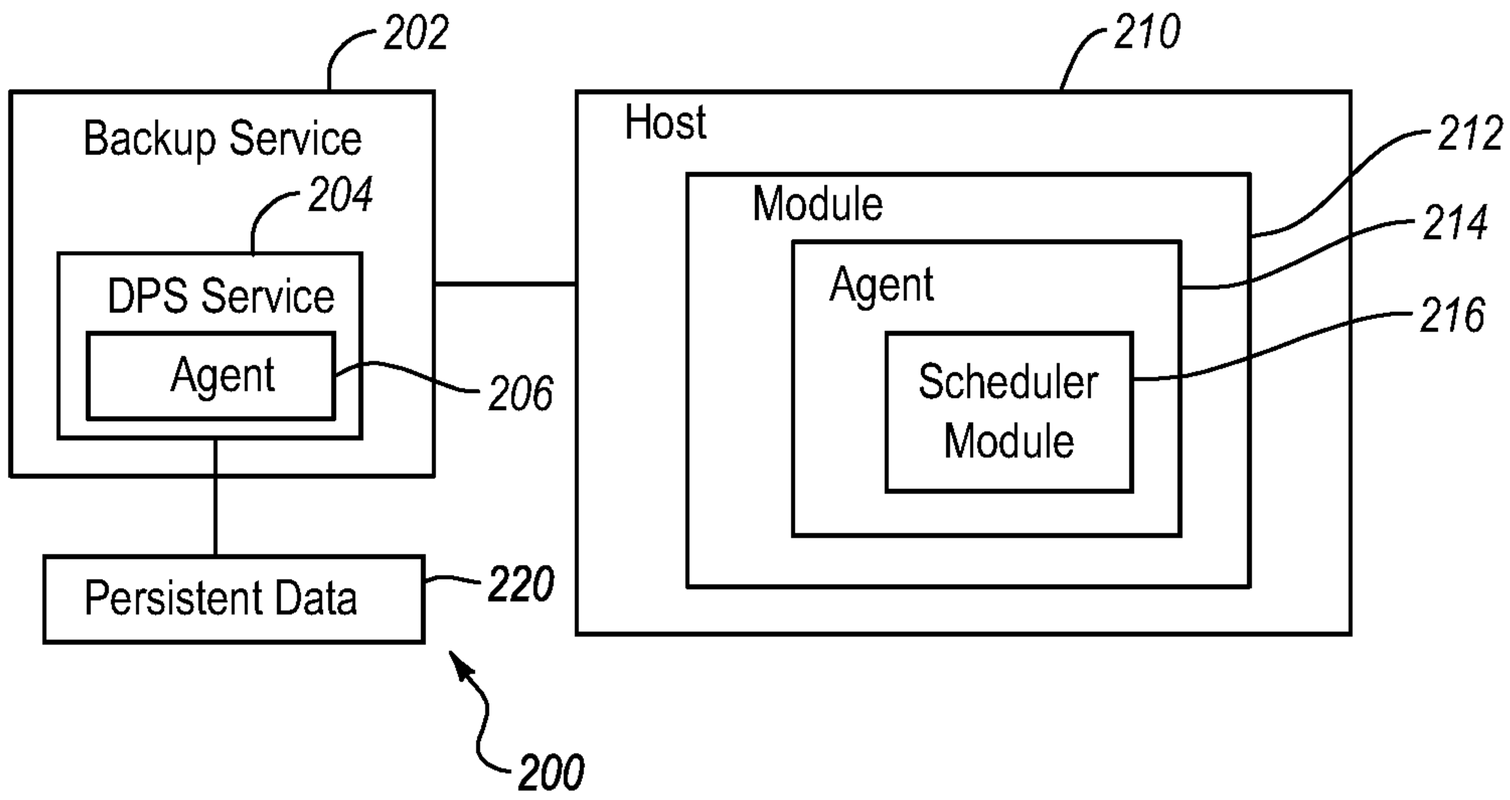
202
Backup Service
204
DPS Service
Agent
206
Persistent Data
220
200
210
Host
Module
Agent
Scheduler Module
212
214
216

FIG. 2

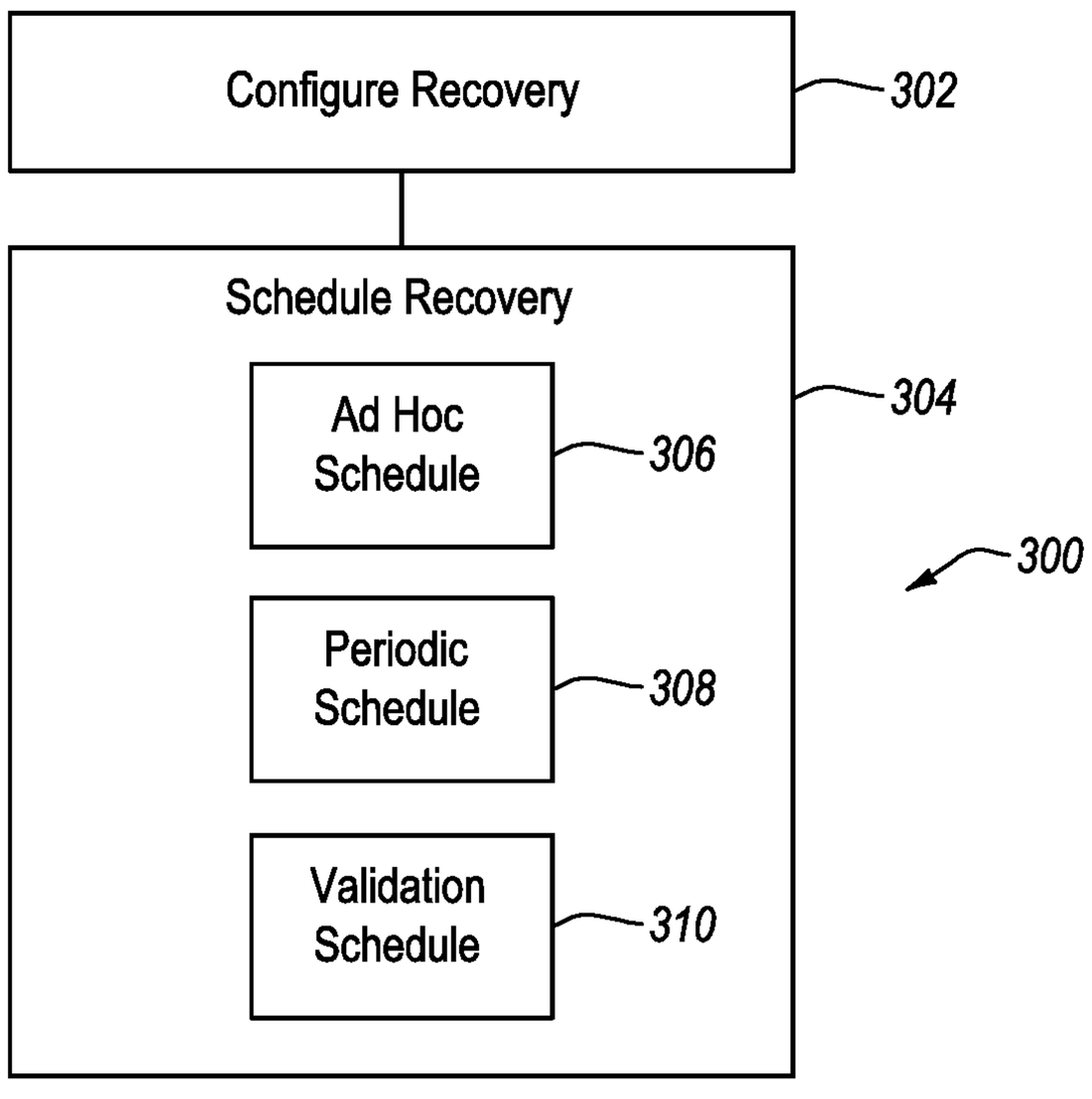
Configure Recovery
302
Schedule Recovery
304
Ad Hoc Schedule
306
Periodic Schedule
308
Validation Schedule
310
300

FIG. 3

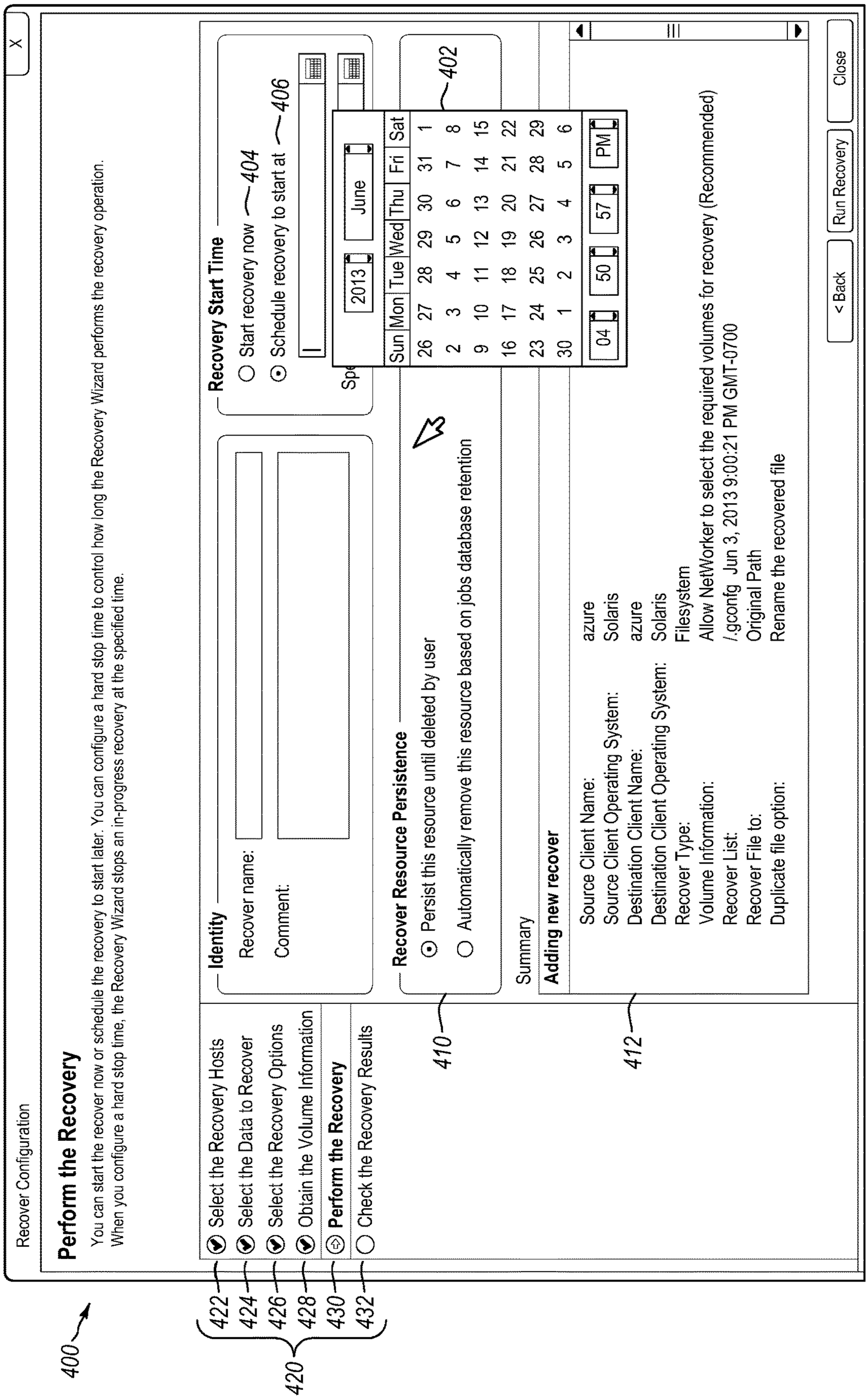
Recover Configuration
Perform the Recovery
You can start the recover now or schedule the recovery to start later. You can configure a hard stop time to control how long the Recovery Wizard performs the recovery operation.
When you configure a hard stop time, the Recovery Wizard stops an in-progress recovery at the specified time.
Select the Recovery Hosts
Select the Data to Recover
Select the Recovery Options
Obtain the Volume Information
Perform the Recovery
Check the Recovery Results
Recovery Start Time
Start recovery now
Schedule recovery to start at
June
2013
Sun Mon Tue Wed Thu Fri Sat
04
50
57
PM
Identity
Recover name:
Comment:
Recover Resource Persistence
Persist this resource until deleted by user
Automatically remove this resource based on jobs database retention
Summary
Adding new recover
Source Client Name: azure
Source Client Operating System: Solaris
Destination Client Name: azure
Destination Client Operating System: Solaris
Recover Type: Filesystem
Volume Information: Allow NetWorker to select the required volumes for recovery (Recommended)
Recover List: /.gconfg Jun 3, 2013 9:00:21 PM GMT-0700
Recover File to: Original Path
Duplicate file option: Rename the recovered file
< Back
Run Recovery
Close
400
420
422
424
426
428
430
432
402
404
406
410
412

FIG. 4

SCHEDULED RECOVERY IN A DATA PROTECTION SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a Continuation of U.S. patent application Ser. No. 13/927,432 filed Jun. 26, 2013, and issued on Feb. 27, 2018 as U.S. Pat. No. 9,904,606 which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

1. The Field of the Invention

Embodiments of the present invention relate to backing up and recovering data. More particularly, embodiments of the invention relate to systems and methods for scheduling the recovery of data in a data protection system.

2. The Relevant Technology

Computers have become ubiquitous in our society and many people interact with computers every day. People use computers to work on documents, spreadsheets, or presentations, create computer code, generate and maintain databases, send email, or the like. Computers are also used, for example, to conduct online activities such as shopping or surfing.

In each case, the user is interacting with data in some form. The data is often important and it is advisable to protect the data for many reasons. Online booking agencies and associated businesses, for example, rely on up-to-date and accurate data in order to make reservations, monitor demand, or set pricing, to name a few. Other entities and business may have in-house data (e.g., documents, reports) that also need protection.

Data can be protected by making a backup copy of the data. The backup copy is usually stored so that if something happens to the original data, the backup copy can be used for recovery purposes. Backup data can also be used for other reasons. For example, backup data enables data to be viewed as it existed at various times in the past.

Once data has been backed up, it may become necessary to recover the data for various reasons. However, a recovery process is conventionally attended by a user and the automated recovery of data. Even when data has been backed up, there is no guarantee that the data can be successfully recovered. Systems and methods are needed to automate the recovery process and to configure a recovery operation such that the recovery operation can be run unattended. Systems and methods are also needed to help ensure that backed up data can be successfully recovered.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to describe the manner in which at least some of the advantages and features of the invention can be obtained, a more particular description of embodiments of the invention will be rendered by reference to specific embodiments thereof which are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, embodiments of the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings, in which:

FIG. **1** illustrates an example of an environment that includes a data protection system configured to protect data;

FIG. **2** illustrates an example of a backup server and a host in the context of a data protection system;

FIG. **3** illustrates a flow diagram of a method for scheduling a recovery operation for a host; and

FIG. **4** illustrates an example of a user interface for scheduling a recovery operation.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the invention relate to systems and methods for protecting data. Embodiments of the invention relate a data protection system configured to protect data. Protecting data can include at least backing up the data and/or recovering the data. Embodiments of the invention enable recovery operations to be scheduled to occur in an automated manner and/or time-shifted. The recovery operations can be ad hoc recovery operations, periodic recovery operations, validating recovery operations, or the like or any combination thereof.

During a recovery operation of protected data (e.g., from a backup of the protected data), the information or configuration information necessary to perform the recovery operation is collected and saved by the data protection system. The data protection system includes a scheduling module, may be instantiated in different locations, is used to schedule the recovery operation. The scheduling module may be part of a user interface that collects the configuration information for the recovery operation. In an embodiment, scheduling the recovery operation can be integrated into a workflow of a recovery operation.

The data protection system can include various modules or components that can be installed on different devices. Some modules of the data protection system may operate on a server computer while other modules may operate on another device or computer (e.g., a host machine or host). In addition, the data protection operations discussed herein can be configured from another device. A recovery operation, for example, can be scheduled, from a host device, from a backup server, or from another device that may be remote to both the backup server and the host device for which the recovery operation is being scheduled.

The modules operating on the host and on the server cooperate schedule the recovery operation. In some instances, embodiments of the invention enable a recovery operation to be configured and the actual recovery of the data will be performed at a later time as scheduled.

The recovery of data of the scheduling of a recovery operation may be initiated through a user interface (UI) regardless of how the host is configured (e.g., a client device, a server, a database, a filestore, etc.) and regardless of the type of data on the host. The user interface may present a user with a workflow that may walk a user through the process of configuring the recovery operation. The configuration information is collected during execution of the workflow and stored until the scheduled time. Some aspects of the user interface or of the workflow may be common to all or most recovery operations that may be performed on other hosts. Other aspects of the workflow may be dynamically added to the user interface. For example, the user interface may include a plug-in that allows portions of the workflow to be adapted to the specific circumstances of the host and the host of the data.

A recovery operation can be scheduled on an ad hoc basis. In the workflow, for example, a user may be able to specify

a particular time for the backup. The recovery operation can also be scheduled on a periodic basis. Each recovery of the periodic recovery may involve the same data or a different view of the data or different views of the data as the data existed at different times.

In addition, embodiments of the invention enable the backed up data to be validated. For example, once a recovery has been performed, the recovered data may be reviewed for accuracy. This may include performing heuristics on the recovered data. For example operating system commands may be used to interrogate folders or sizes in the recovered data and comparing the sizes to the size in the image. Determining whether a specific file can be read or that the file contains specific data. Checksum operations over all or part of the data can be performed. Multiple programmatic ways to check the validity of the recovered data can be performed to ensure that the data is readable and recovered.

FIG. **1** illustrates an example of an environment **100** that includes a data protection system **102** configured to protect data. Data can be protected by backing up the data and/or recovering or restoring the data and/or by configuring backup or recovery operations. The data protection system **102** in the environment **100** includes modules that are configured to backup data and/or recover data.

The environment **100** may be a network such as a local area network, a wide area network, or any other networked configuration. The environment **100** may include various devices including servers and other computers that are interconnected. The data stored in the system and/or the software operating the environment **100** may be cloud based, network based, or single computer based or combination thereof. The data protection system **102** or portions thereof may be implemented in a cloud or internet environment or other networked environment.

The data protection system **102** is implemented in the environment **100**. The components or modules of the data protection system **102** can be installed on multiple devices. The data protection system **102** can include both server side components or modules and device or host side components or modules. The various modules cooperate protect data in the environment **100**. The data protection system **102** can include hardware and/or software aspects.

The data protection system **102** may include, by way of example only, a backup server **104**. A data protection system (DPS) service **106** may be operating on the backup server **104** or on another computer that coordinates with the backup server **104**. The data protection system **102** may also include or be associated with storage **108**. The storage **108** is configured to store backups **110**, which are backups of data in the environment **100**. The storage **108** may be networked storage, cloud based storage, disk arrays, tape media or the like or any combination thereof. The DPS service **106** may be web-enabled to enable remote access.

FIG. **1** further illustrates that the environment **100** includes hosts **120**. The number of hosts **120** in the environment **100** (e.g., in a network) can vary and can be of different types. In one example, the hosts **120** may all be part of the same network or associated with the same entity. The hosts **120** can include, by way of example only, servers **122** (e.g., a file server, an email server), computers **124** (e.g., desktop computers, laptop computers, tablet devices, smartphones), virtual machines **126**, databases **128**, or the like or any combination thereof. Each of the hosts **120** is often associated with its own data. The server **122** is associated with the data **132**, the computer **124** is associated with the data **134**, the virtual machines **126** have the data **136** (the storage for the virtual machines may an integral part of the virtual machines), and the database **128** is associated with the data **138**.

Generally, the data **130** of the environment may be stored on a storage pool, on hard disk arrays, on networked storage or the like or any combination thereof. Alternatively, some of the storage for some of data **130** may be specific to a particular host. For instance, the data **138** of the database **128** may be resident on storage that is not available to other hosts. Alternatively, the data **1398** may correspond to part of a storage pool or file server that has been assigned to the database **128**. Other hosts may be similarly configured. More generally, however, the data **130** may be stored on multiple storage devices and in various storage configurations.

In the data protection system **102**, the DPS service **106** cooperates with modules **140**, **142**, **144**, and **146** to perform backup and/or recovery operations. When recovering the server **122**, for example, the DPS service **106** coordinates with the module **140** to recover the data **132** or to recover a portion of the data **132**. The DPS service **106** may also coordinate with the module **140** to configure the recovery operation for the server **122**.

Backup and/or recovery operations can be performed for each of the hosts **120** individually. The recovery of data for a particular host, however, may also impact another host. For example, if the server **122** is an email server and the data **132** corresponds to the mailboxes of multiple users, then recovery of the data **132** may have an impact on other hosts—for example the computers **124** associated with the users. In addition, data can be restored to a new host that is not the host from which the data was backed up.

In some instances, the recovery operation may be performed to validation purposes. In this case, there may be no damage to the original data or the operation of the data **130**. Rather, the recovery operation is performed in order to validate that the data can be successfully recovered.

The backups **110** can include one or more backups of each of the hosts **120**. Advantageously, the data of the hosts **120** can be recovered at different points of time. The backups **110** may include full backups, partial backups, snapshots, content addressed data, de-duplicated data, or the like or any combination thereof.

FIG. **2** illustrates an example of a backup server **202** and a host **210** in the context of a data protection system **200**. The backup server **202** is an example of the backup server **104** and the host **210** is an example of one of the hosts **120**. During a backup or recovery operation, the backup server **202** coordinates with the host **210** or, more specifically, the DP service **204** coordinates with the agent **214**. The configuration of a backup or recovery operation, however, may be performed from the host **210** or from another device.

The DPS service **204** coordinates with the module **212** to configure and/or perform the recovery or backup operation to protect data of the host **210**. The module **212** on the host **210** includes a host agent **214** and a user interface **218** that participate, in some embodiments, in the recovery and/or backup operations.

The DPS service **204** may be web enabled. This allows a user to configure a recovery operation for the host **210** from another location or device. The user interface and plug in presented over the web interface may be the same as the user interface used at the host **210** for a recovery operation.

In one example, the user interface **218** is initiated (whether on the host **210** or on a remote device) and the host **210** is selected as the destination of the recovery operation, although another host may be designated as the destination

of the recovery operation. The module **212** is then queried to identify and select a client backup module, which can influence the workflow presented in the user interface **218**. A client backup module is part of the data protection software and is designed to protect the storage or data of the host **210** host in a particular way. For example, the client backup module may protect a native or attached file system storage in a particular way or may protect a running application such as a database or mail server in another way.

After the client backup module is selected, the host agent **214** is initiated. The host agent **214** implements an interface between the user interface **218** and retrieves one of the modules **206**, which may be plug-ins. The DPS service **204** may keep modules for various versions of the module **212**. This can simplify development of the module **212** and of the user interface **218**.

The user interface **218** can communicate with the agent **214**, which allows the agent **214** to perform any tasks necessary to configure the recovery operation. The recovery operation can then commence. The scheduler **216**, which may be part of the module **212** and may be incorporated into the user interface **218**, is invoked to schedule the recovery operation.

When a recovery operation is configured and scheduled, the configuration information, the scheduling information, and/or the type of recovery can be maintained as persistent data **220**. The backup server **202** can use the persistent data **220** to perform the scheduled recovery operation at the scheduled time.

FIG. **3** illustrates a flow diagram for scheduling a recovery operation for a host. The method **300** illustrated in FIG. **3** may begin by configuring a recovery operation in box **302**. Configuring a recovery operation may include accessing the DPS service, selecting a host, selecting a backup to recover to the host, selecting a type of recovery based on the client backup module, or the like.

Configuring the recovery operation also includes scheduling the recovery operation in box **304**. In box **306**, an ad hoc schedule may be performed. In this case, the recovery operation is scheduled to conduct a recovery based on data from a specific point in time or from a specific backup that was identified during the configuration of the recovery operation. For example, an ad hoc scheduled recovery operation may recover data from a particular time and date. In addition, an ad hoc scheduled recovery operation can be scheduled to be performed with the network is not as busy.

In box **308**, a periodic schedule may be selected. In this case, a periodic schedule may cause the data protection system to perform the recovery operation on, by way of example only, a weekly basis or a monthly basis. Repeatedly recovering the exact same data can be done, but a periodic schedule may be set to use a relative date. For example, the periodic schedule may be set to recover data based on a time period that is determined at the time of the recovery operation. When the recovery operation is set for each Friday, for example, the recovery operation may recovery the data from 2 days prior. In one example, this may recover the same file, but in a time shifted manner. In other words, because the content of the file may change over time, the same data (e.g., files) may be recovered. However, the content of the data may have changed. Periodic recovery operations can validate the recovery process.

In box **310**, a validation schedule may be selected and performed. A validation recovery can be used to ensure that the protected data can be successfully recovered. In box **310**, the recovered data can be validated using, for example, heuristics. The data protection system may validate the recovered data by scanning the recovered data to ensure that the data is readable. The data protection system may validate the recovered data by comparing a total size of the recovered data to an expected recover size. Specific files may be opened and searched for specific terms to validate the recovery. The data may be spot-checked for accuracy. A check sum may be employed to validate the recovered data. These are examples are not limiting as other ways to validate the recovered data may be performed.

In addition, scheduling the recovery operation in box **304** may include a combination of schedules. For example, a recovery operation that is scheduled as a validating recovery operation may also be scheduled as an ad hoc recovery or as a periodic recovery. In some instances, the host or destination of the recovery operation may not be the host of the original data. This enables a recovery operation to be performed such that the user is assured that the data can be recovered without interfering with current data used by the hosts.

Embodiments of the invention can make the recovery operation an automated process and enable a recovery operation to be performed un-attended.

FIG. **4** illustrates an example of a user interface that includes elements for scheduling a recovery operation. A user interface **400** includes a workflow for performing a recovery operation, which includes scheduling the recovery operation. The user interface **400** includes a workflow **420** that includes, in one example, a method for performing a recovery operation. At **422**, recovery hosts are selected. This may include selecting the host on which the user interface is displayed or selecting a different host for recovery that is different from the device on which the user interface **400** is displayed.

At **424**, the data to recover is selected. This may include identifying a file, or a mailbox, or a directory, or a folder, or a partition, or other data grouping, volume or plurality thereof. At **426**, the recovery options are selected. In one example, the recovery options may include the scheduling information. For example, a recovery start time such as start recovery now at **404** or schedule the recovery at **406** using a calendar **402**. At **410**, a user can identify whether a recover resource is to be persisted. Box **412** includes an example of configuration information that may be stored as persistent data. The recovery options may also enable the user to select an ad hoc recovery, set a periodic recovery, or set up a validating recovery.

At **428**, volume information is obtained. At **430** the recovery is performed. Actually recovering the selected data to the selected host, however, may occur to the schedule selected when setting the recovery options. At **432**, the recovery results may be checked or verified. Although the recovery results are verified, a validating recovery may review the recovered data in a different way including the use of heuristics, which may consume less resources.

The DPS system can protect the data of a host through, by way of example, a series of periodic data protection events (e.g., snapshots or other backup). At some point in time, a request is made to recover at least a portion of the data. A recovery operation, which is performed to recover the requested data, can be scheduled in multiple ways—ad hoc, periodic, validating, or combination thereof. The user interface on the host (or on another device) is started and a host is selected for a recovery operation. The recovery operation is then configured and the information that describes the configuration of the recovery operation is stored as persistent data. The scheduling information may also be included

in the persistent data. At the scheduled time, the data is recovered in accordance with the configuration information stored in the persistent data.

Embodiments of the invention further relate to methods for preparing a host for a recovery operation, for example as illustrated at least in FIG. **3**. Preparing the host can include at least one of configuring a recovery operation, scheduling the recovery operation, and/or performing the recovery operation. The actual implementation of a configured recovery operation can be time delayed. A user may schedule a recover that is performed when the system is experiencing less use (e.g., during the night).

Embodiments of the invention relate to a method for preparing a recovery operation to recover data on a host or on behalf of a host. Initially, a host is selected for the recovery operation. Once the host is selected, a user interface is displayed or presented. The user interface can include a workflow that, when executed, generates configuration information and scheduling information for the recovery operation. As previously stated, some aspects of the workflow may be generated using a plug-in. Once the recovery operation is configured and scheduled, the recovery operation is performed according to the schedule.

The embodiments described herein may include the use of a special purpose or general-purpose computer including various computer hardware or software modules, as discussed in greater detail below. Embodiments of the invention relate to methods for protecting data, devices configured to protect data, and computer-readable media.

Embodiments within the scope of the present invention also include computer-readable media for carrying or having computer-executable instructions or data structures stored thereon. Such computer-readable media can be any available media that can be accessed by a general purpose or special purpose computer. By way of example, and not limitation, such computer-readable media can comprise RAM, ROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to carry or store desired program code means in the form of computer-executable instructions or data structures and which can be accessed by a general purpose or special purpose computer. Combinations of the above should also be included within the scope of computer-readable media.

Computer-executable instructions comprise, for example, instructions and data which cause a general purpose computer, special purpose computer, or special purpose processing device to perform a certain function or group of functions. Although the subject matter has been described in language specific to structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims.

As used herein, the term "module" or "component" can refer to software objects or routines that execute on the computing system. The different components, modules, engines, and services described herein may be implemented as objects or processes that execute on the computing system (e.g., as separate threads). While the system and methods described herein are preferably implemented in software, implementations in hardware or a combination of software and hardware are also possible and contemplated. In this description, a "computing entity" may be any computing system as previously defined herein, or any module or combination of modulates running on a computing system.

In at least some instances, a hardware processor is provided that is operable to carry out executable instructions for performing a method or process, such as the methods and processes disclosed herein. The hardware processor may or may not comprise an element of other hardware, such as the computing devices and systems disclosed herein.

In terms of computing environments, embodiments of the invention can be performed in client-server environments, whether network or local environments, or in any other suitable environment. Suitable operating environments for at least some embodiments of the invention include cloud computing environments where one or more of a client, server, or target virtual machine may reside and operate in a cloud environment.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

1. A method for scheduling a recovery operation to recover data of a host, wherein different types of data stored in the system are backed up using different client backup modules, the method comprising:

identifying a client backup module that backed up a host in order to determine a manner in which data of the host was backed up by the client backup module;

coordinating with a backup service to identify a recovery module from among multiple recovery modules based on the client backup module used in backing up the data of the host and based on circumstances of the host to which the data is being recovered by the recovery operation;

displaying a workflow in a user interface for recovering the host;

dynamically adapting the workflow based on the identified recovery module, at a time of scheduling the recovery operation, to account for the manner in which the data was backed up by the identified client backup module and the circumstances of the host;

saving the workflow as persistent data;

scheduling the recovery operation as an adhoc recovery operation or a periodic recovery operation; and

performing the recovery operation in accordance with the persistent data, wherein the recovery module is dynamically retrieved from the backup service when the recovery operation is performed, wherein the backup service is configured to maintain a plurality of recovery modules for selection by the recovery operation.

2. The method of claim **1**, further comprising validating the recovered data.

3. The method of claim **2**, further comprising performing heuristics on the recovered data to validate the recovered data.

4. The method of claim **1**, further comprising selecting the host for the recovery operation.

5. The method of claim **1**, further comprising coordinating with the backup service to select the recovery module, wherein the selection of the recovery module is further based on the host to which the data is being recovered by the recovery operation.

6. The method of claim 1, further comprising displaying the user interface on the host being recovered or on a separate device.

7. A non-transitory computer readable medium comprising computer executable instructions that, when executed, perform a method for scheduling a recovery operation to recover data of a host, wherein different types of data stored in the system are backed up using different client backup modules, the method comprising:

identifying a client backup module that backed up a host in order to determine a manner in which data of the host was backed up by the client backup module;

coordinating with a backup service to identify a recovery module from among multiple recovery modules based on the client backup module used in backing up the data of the host and based on circumstances of the host to which the data is being recovered by the recovery operation;

displaying a workflow in a user interface for recovering the host;

dynamically adapting the workflow based on the identified recovery module, at a time of scheduling the recovery operation, to account for the manner in which the data was backed up by the identified client backup module and the circumstances of the host;

saving the workflow as persistent data;

scheduling the recovery operation as an ad hoc recovery operation or a periodic recovery operation; and

performing the recovery operation in accordance with the persistent data, wherein the recovery module is dynamically retrieved from the backup service when the recovery operation is performed, wherein the backup service is configured to maintain a plurality of recovery modules for selection by the recovery operation.

8. The method of claim 7, further comprising validating the recovered data.

9. The method of claim 8, further comprising performing heuristics on the recovered data to validate the recovered data.

10. The method of claim 7, further comprising selecting the host for the recovery operation.

11. The method of claim 7, further comprising coordinating with the backup service to select the recovery module, wherein the selection of the recovery module is further based on the host to which the data is being recovered by the recovery operation.

12. The method of claim 7, further comprising displaying the user interface on the host being recovered or on a separate device.

13. A method for scheduling a recovery operation to recover data of a host, wherein different types of data stored in the system are backed up using different client backup modules, the method comprising:

coordinating with a data protection service to configure a recovery operation of a host by:

selecting the host from amongst a plurality of hosts;

selecting a backup associated with the selected host from a plurality of backups associated with the selected host;

determining a manner in which data of the host was backed up;

selecting a type of recovery based on the manner in which the data of the host was backed up;

displaying a workflow in a user interface for recovering the host;

dynamically adapting the workflow based on the type of recovery, at a time of scheduling the recovery operation, to account for the manner in which the data was backed up and a present circumstance of the host; and

saving the workflow including as persistent data;

scheduling the recovery operation as an ad hoc recovery operation or a periodic recovery operation or a validating recovery operation; and

performing the recovery operation in accordance with the persistent data.

14. The method of claim 13, further comprising determining a manner in which the data of the host was backed up by identifying a client backup module that generated the selected backup.

15. The method of claim 14, further comprising selecting a type of recovery by selecting a recovery module from a plurality of recovery modules maintained by the data protection service, wherein the recovery module dynamically adapts the workflow to account for the manner in which the data was backed up and the present circumstance of the host.

16. The method of claim 13, further comprising scheduling the recovery operation, wherein at least one of:

the periodic recovery operation includes setting a relative date that is based on a date on which each recovery operation in the periodic recovery operation is performed; and

validating the recovery operation, wherein validating the recovery operation includes performing heuristics to validate the recovered data.

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